Aug. 13, 1935. C. M. F. FRIDEN ET AL 2,011,274

CALCULATING MACHINE

Original Filed Feb. 8, 1930

FIG. 1.

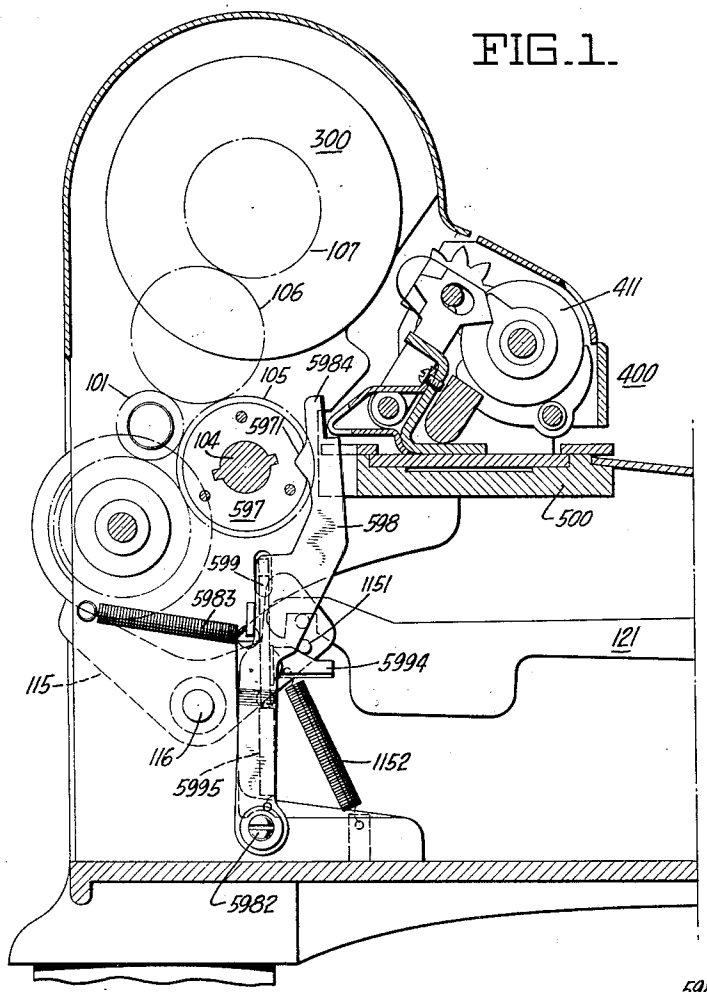


FIG. 3.

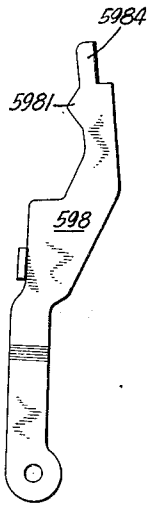
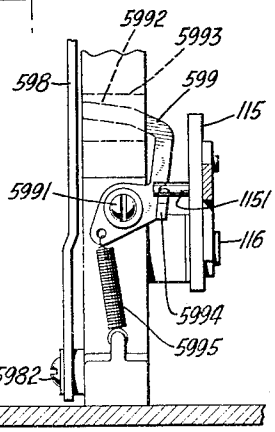


FIG. 4.



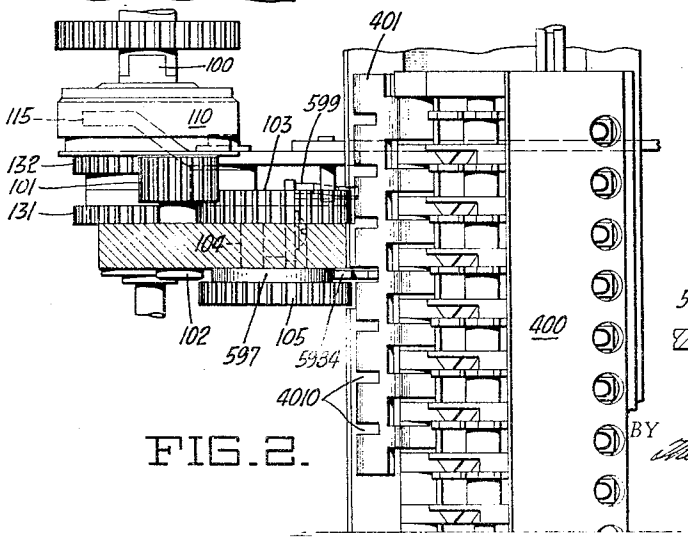


FIG. 2.

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CALCULATING MACHINE

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11 Claims. (Cl. 235—130)

The invention relates to calculating machines and particularly to calculating machines equipped with a longitudinally displaceable carriage for accumulating values therein during computations.

An object of the present invention is to provide suitable instrumentalities for positively locking the carriage of a calculating machine against longitudinal movement during the time that the actuator is out of full cycle position.

Another object of the invention is to provide means for latching the carriage locking mechanism in active position during multicyclic operation of the actuating means.

Another object of the invention is to provide means for latching a centralizing means in inoperative position during multicyclic operation of the actuating means.

Another object of the invention is to provide means for latching a displaceable member in displaced position during multicycle operations when oscillation of such member upon each cycle of movement of the actuator is undesirable.

A further object is to provide a carriage locking mechanism with the above attributes which can be readily incorporated in a calculating machine without materially changing the construction of the same.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth in the following description where will be outlined in full that form of the invention which has been selected for illustration in the drawing accompanying and forming part of the present specification.

Referring to the drawing, Figure 1 is a longitudinal vertical section through part of a calculating machine embodying the present invention.

Figure 2 is a fragmentary sectional plan view of the parts illustrated in Figure 1.

Figure 3 shows a detail of the new mechanism.

Figure 4 is a partial front elevation of the new carriage locking devices.

The form of construction selected for illustration in the present application will be rather specifically described, but it is to be understood at the outset, that within the scope of the invention as claimed, variations may be made.

The calculating machine embodying the present invention is of the rotary type, having a rotatable actuator of the reversible cycle type, which is rotated from initial or neutral stop position through a complete cycle in either direction to perform a calculating operation. Values are entered into this actuator and are, upon rotation of the same, transmitted to an accumulator register which is arranged on a carriage, normally stationary with respect to the actuator, but displaceable longitudinally to the axis of said actuator to make direct action of the actuator on any of the various numeral wheels of the accumulator possible.

The means for entering the values into the actuator and the means for shifting the accumulator carriage from one value position to another are not shown in the accompanying drawing, but any suitable mechanism, such as disclosed in the Friden Patent 1,643,710, may be used for this purpose. It is necessary, however, to provide interlocking means between the actuator and the accumulator carriage displaceable relatively thereto, to prevent the operator from employing the shifting mechanism of the latter while the actuator is out of full cycle position, or from manipulating the actuator controls while the carriage is being displaced to a higher or lower numerical order. It can be readily seen that with this interlocking mechanism incorporated in the calculating machine, the mechanism of said machine is safeguarded against faulty operation on the part of the operator, and against serious damage to parts of the machine which would necessarily result therefrom. It is also apparent that the provision of latching means to hold a displaceable member in displaced or inoperative position during multicyclic operation eliminates wear on the parts and also serves to reduce noise in the machine.

This locking mechanism and the latching mechanism therefor which constitute the specific embodiment of the present invention is shown in the accompanying drawing in connection with an electrically driven calculating machine, but it is understood that it can also be embodied in a manually operable calculating machine without changing the construction of the mechanism concerned.

The calculating machine disclosed in this application comprises a base plate, mounted thereon are two side plates and a center plate, between which are arranged the various devices for controlling the operation of the machine. Among these devices is a clutch 110 which controls the duration of operation of the calculating mechanisms upon depression of certain control keys not here shown. The clutch 110 is of the ratchet wheel and pawl type, and serves to connect the drive shaft 100 with the shaft to be driven when one of the control keys is depressed, and bell crank 115, pivotally secured to shaft 116, is rocked

to release the pawl within said clutch housing. The clutch housing is now connected with the driving element and rotates in unison therewith.

Two gears, 131 and 132, are secured to the clutch housing in such a way that either one of the two gears is rotated by the clutch housing to transmit movement to the actuating elements, as shown in the patent to Friden, Number 1,682,901.

If it is desired to rotate the actuator 300 in a positive direction, as during addition and multiplication, gear 131 is coupled to said clutch housing and transmits movement to the actuator through gears 103, 105, 106, and 107. If, on the other hand, the actuator 300 is to rotate in a negative direction, as during subtraction and division, the gear 132 is then engaged to be rotated by the clutch 110. In that case, rotational movement is transmitted to the actuator 300 through the gear train 132, 101, 103, 105, 106, and 107.

Disposed directly in front of the actuator 300, and shiftably arranged thereto, is an accumulator carriage 400 which rests on a guiding member 500 so as to permit said carriage to move longitudinally, parallel to the axis of the actuator. Suitable means are provided for shifting the carriage in either a step-by-step movement, or continuously to either end of its range of travel to permit the action of the actuating elements on the counting wheels 411 of different value. The shifting mechanism for the carriage is not disclosed in this application, since it does not form part of the present invention. Any suitable form of mechanism may be used.

This shifting movement of the carriage must only take place when the actuating elements are in full cycle position, as the mechanism of the machine would be severely damaged otherwise. Means have therefore been provided to prevent accidental operation of the actuator while the carriage 400 is being shifted and vice versa.

Keyed to shaft 104 which carries the two transmission gears 103 and 105, and directly adjacent to the latter, is a cam disc 597 rotatable synchronously with the actuator 300. This cam disc 597 is provided with a recess 5971 which accommodates the nose 5981 of a cam lever 598, pivotally secured to the center frame at 5982, and always held in contact with the cam disc by a spring 5983 which is tensioned between a lug on said lever and a stud riveted to the center frame.

Rotational movement, therefore, of the clutch 110, consequently causes cam disc 597 to rotate and rock lever 598 in a clockwise direction. The recess 5971 is of such dimension that the nose 5981 can only enter recess 5971 when the actuator and associated instrumentalities are in full cycle, or neutral position. It is to be noted that cam disc 597 and lever 598 due to the coaction of recess 5971, nose 5981, and spring 5983 serve as a means to centralize the actuator in full cycle position.

The upper end 5984 of lever 598 is adapted to enter one of the slots 4010 of a plate 401 attached to the accumulator carriage 400 when the actuator is out of full cycle position. The spacing of these slots 4010 is the same as the step spacing of the carriage movement. Therefore, the end 5984 of lever 598 is forced to enter and remain in a slot 4010 of plate 401 through the action of cam disc 597 for the full duration of one complete operating cycle of the actuator and can only be pulled back to its normal or initial position by the spring 5983 after the actuating elements and cam disc 597 have stopped, or are passing through full cycle position. The carriage is therefore securely locked against movement in either direction.

It is also impossible to rotate the actuator 300 while the carriage is being shifted since in that case, plate 401 serves as an abutment for lever 598 and prevents any movement thereof so that cam disc 597 is locked against rotation.

The construction employed in former calculating machines for locking the carriage during computations, only included a cam disc similar to the present one, but of sufficient diameter to stradd'e with its recess, the plate 401 attached to the carriage 400. During operation of the machine, an operator oftentimes "rides" the shifting mechanism with the result that the plate 401 was continuously pressed against a rotating cam disc and the parts concerned were constantly subjected to such great frictional wear that replacements became very frequent and necessary, to prevent misalignment of the calculating elements. With the cam lever 598 included as shown in the drawing, this disadvantage has been entirely overcome.

Means are also provided in the new construction forming part of this application, which cooperate with the automatic clutch control devices to hold the cam lever 598 in its effective position, independent of cam disc 597, when consecutive rotations of the actuator are necessary, as during automatic multiplication or division.

For this purpose, a locking lever 599 has been pivotally secured to the front face of the lower part of the center frame at 5991. This lever is equipped with an upper arm 5992, projecting through a suitable aperture 5993 in the center frame and a lower arm 5994 which extends at right angles to the former and underlies a pin 1151 of the bell crank 115 which controls the position of said lever 599. A tension spring 5995, fastened with one end to the lever 599, and with the other end to the foot of the center frame, retains this locking lever in such a position that arm 5994 thereof is always in contact with the pin 1151 of the bell crank 115 while the other arm 5992 is held normally as shown in Figure 3, slightly away from the cam lever 598. The moment bell crank 115 is rocked by the link 121 to recede from the clutch housing to allow the same to rotate in unison with the drive shaft, the locking lever 599 is also rocked in a counter clockwise direction by the tension spring 5995, the arm 5994 always remaining in contact with the pin 1151 of said bell crank. The upper arm 5992 of course has, at the same time, intersected the path of cam lever 598, and located directly in back of it, retaining the same in its locking position with respect to the carriage locking plate 401, until the bell crank is again allowed to move back to initial location through the action of its strong tension spring 1152. The pin 1151 overlying arm 5994 of locking lever 599, forces the latter to participate in the rocking movement of bell crank 115 and oscillates it to regain its initial or ineffective position against the tension of spring 5995. This movement, of course, has pulled arm 5992 away from the rear face of cam lever 598, and permitted the same to relocate its nose 5981 in the recess 5971 of cam 597.

Thus, it will be seen that the first movement of the actuator, incident to engagement of the clutch, causes the lever 598 to be moved into position to lock the carriage against movement, and the said lever is retained in this locking position by the member 599 which snaps behind it and is not released until the clutch is again disengaged. This

prevents the lever 598 from unlocking the carriage at the end of each cycle in a multicycle operation. Since a hand operated machine does not ordinarily include a clutch, this latching member 599 is desirable only in motor driven models.

We claim:—

1. In a calculating machine having a displaceable carriage, driving means having two directions of movement, a member movable into blocking relation with a portion of said carriage, means controlled by said driving means upon movement in either direction for moving said member, and means for latching said member in blocking position.

2. In a calculating machine having a displaceable carriage, driving means operable from a neutral position through an invariable cycle of movement and back to neutral position, an oscillable member movable into blocking relation with a portion of said carriage, means controlled by said driving means upon cyclic movement for moving said member, and means for latching said member.

3. In a calculating machine having a displaceable carriage, driving means operable from a neutral position through an invariable cycle of movement and back to neutral position, a reciprocable member operable by said driving means upon cyclic movement and engageable with said carriage to prevent displacement thereof, and means for latching said member in engagement with said carriage.

4. In a calculating machine having a displaceable carriage, cyclically operable driving means, controlling means therefor, means controlled by said driving means for locking said carriage against displacement, and means controlled by said drive controlling means for latching said locking member in operative position during multicyclic operation.

5. In a calculating machine having a displaceable carriage, driving means, a control element therefor, a member movable into blocking relation with a portion of said carriage, means controlled by said driving means upon cyclic movement for moving said member, and means controlled by said control element for latching said member in engagement with said carriage.

6. In a calculating machine having a displaceable carriage, driving means, a control element therefor, a member movable into blocking relation with a portion of said carriage, means controlled by said driving means upon cyclic movement for moving said member, means for latching said member, and means controlled by said control element for moving said latching means to inoperative position.

7. In a calculating machine having a displaceable carriage, driving means, a member movable into blocking relation with a portion of said carriage, means controlled by said driving means upon cyclic movement for moving said member, means for latching said member in engagement with said carriage and means for moving said latching means to inoperative position.

8. In a calculating machine having a displaceable carriage, driving means, a control element therefor, a member movable into blocking relation with said carriage upon cyclic movement of said driving means, a normally restrained latch for said member, and means controlled by said control element for releasing said latch.

9. In a calculating machine having a displaceable carriage, driving means, a control element therefor, a member movable into blocking relation with said carriage upon cyclic movement of said driving means, a normally restrained latch for said member, and means controlled by said control element upon drive engaging movement for releasing said latch and upon drive interrupting movement for restoring said latch to restrained position.

10. In a calculating machine having driving means, a control element therefor, a member movable by said driving means upon cyclic movement thereof, and devices for inhibiting further movement of said member during multicyclic operations, comprising means controlled by said control element upon drive engaging movement for latching said member in its displaced position and upon drive interrupting movement for delatching said member.

11. In a calculating machine having cyclically operable actuating means, controlling means therefor, means displaceable by said actuating means upon passing through full-cycle position, and devices for inhibiting further movement of said displaceable means during multicyclic operations, comprising means controlled by said controlling means upon drive engaging movement to latch said displaceable means in displaced position, and means controlled by said controlling means upon drive interrupting movement to delatch said displaced means.

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